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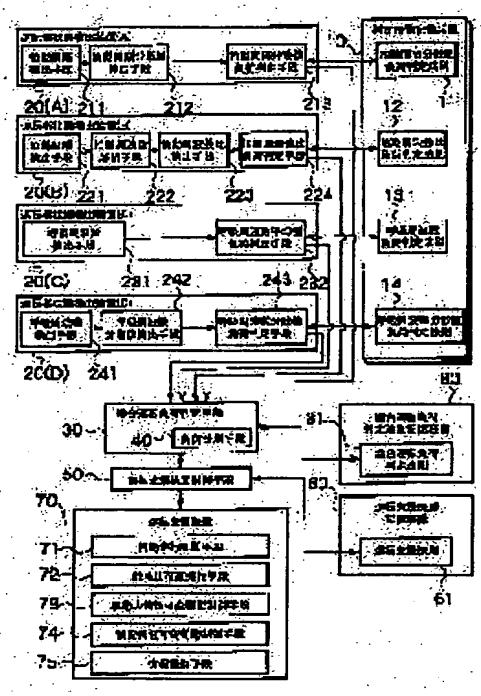
(54) DRIVING LOAD JUDGMENT DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To accurately judge a driving load.
SOLUTION: This device is provided with a judgment rule storage device 10 holding the biological signal tendency of a driver and the load state of the driver in relation as load judgment rules 11, 12, 13 and 14, driver state detectors 20A, 20B, 20C and 20D for measuring one kind of the biological signals of the driver and outputting driver load data based on the biological signals and the load judgment rules 11, 12, 13 and 14 held in the judgment rule storage device 10 and a general driving load judgment means 30 for judging the load state of the driver based on the plural driver load data outputted by the driver state detectors 20A, 20B, 20C and 20D.



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* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to operating-duty judging equipment.
[0002]
[Description of the Prior Art] In recent years, the equipment which judges an operator's mental loaded condition from the inclination of change of the heartbeat change RRV (R-R Variance) computed from a heartbeat signal and the inclination of change of two peak components which carries out frequency analysis of the heartbeat interval RRI (R-R Interval), and obtains it, and the equipment which gives a limit to presentation and vehicles control of an alarm according to the judgment result of these equipments are developed.
[0003] For example, the defatigation accumulation judging method, a system, and a transport-airplane machine given in JP,8-131424,A By detecting an operator's heartbeat condition and comparing change, distribution, or standard deviation of the pulsation interval at the 2 time left serially It is the method of judging an operator's defatigation accumulation, and when an operator's defatigation accumulation is judged to be size, they are the equipment which falls the speed of vehicles or restricts travelling direction, and a transport-airplane machine.
[0004] Moreover, mentation judging equipment given in JP,8-280637,A detects an operator's heartbeat interval, and is mentation judging equipment which develops two extracted frequency components to a two-dimensional plane, and judges the state of mentation from the change pattern on the coordinate after performing frequency analysis to the detected heartbeat interval.
[0005]
[Problem(s) to be Solved by the Invention] However, with the former operator's load judging equipment mentioned above, the mental load of the operator under vehicles operation is judged only by the fluctuation RRV of a heartbeat signal. However, when the device which generates electric noises, such as a motor with which the vehicle interior of a room was equipped, starts, these electric noises may mix in a heartbeat signal, and there is no guarantee to which control of the vehicles further based on the judgment with the judgment of the mental load by the unitary information source is performed, and information offer is not necessarily performed correctly.
[0006] Moreover, with the latter operator's load judging equipment mentioned above, the mental load is judged from tracing with two peak components which carry out frequency analysis of the pulsation interval RRI, and obtain it, i.e., the blood-pressure labile elements, and the respiratory labile elements to draw. However, since this method contains the respiratory labile elements as mentioned above, the time of a run of a highway etc. is the effective judgment technique, only when the load to an operator is maintained at a fixed state and can carry out respiration of about 1 fixed cycle. For example, since an operator is usually difficult to breathe in a fixed rhythm when the so-called physical load which operation of an accelerator, a brake, and a steering follows [the run or curve in a town] continuously is imposed, the influence of a physical load may be mixed in the judgment result of the mental load by this method as a noise.
[0007] this invention makes a technical problem offer of operating-duty judging equipment which can perform a load judging of an operator to accuracy more.
[0008]

[Means for Solving the Problem] The diagnosis rule storage which invention of a claim 1 associated an operator's biomedical signal inclination and an operator's loaded condition, and was held as a load diagnosis rule, The operator state detection equipment which outputs an operator load data based on the aforementioned load diagnosis rule which measured one kind of an operator's biomedical signal, and was held at this biomedical signal and the aforementioned diagnosis rule storage, It is characterized by having a comprehensive operating-duty judging means to judge an operator's loaded condition based on two or more operator load datas which the aforementioned operator state detection equipment outputted.

[0009] Invention of a claim 2 is operating-duty judging equipment according to claim 1, and is based on two or more aforementioned operator load datas. It has the comprehensive operating-duty diagnosis rule storage holding the comprehensive operating-duty diagnosis rule which classifies an operator's operating-duty condition into a mental load and a physical load. the aforementioned comprehensive operating-duty judging means It is characterized by having a load judgment means to classify the judgment of an operating-duty state into a mental load and a physical load, and to perform it, based on two or more aforementioned operating-duty data and the aforementioned comprehensive operating-duty diagnosis rule.

[0010] Invention of a claim 3 is operating-duty judging equipment according to claim 1 or 2. the aforementioned operator state detection equipment It has a pulsation interval distribution value calculation means to compute the distributed value of the pulsation interval for every predetermined time based on a pulsation interval detection means to detect an operator's pulsation interval, and the pulsation interval detected by the aforementioned pulsation interval detection means. The load diagnosis rule held at the aforementioned diagnosis rule storage It is the pulsation interval distribution value load diagnosis rule which classifies an operator's operating-duty condition according to the degree based on an operator's pulsation interval distribution value. It is characterized by having a pulsation interval distribution value load judging means to judge an operator's loaded condition, based on the distributed value of a pulsation interval and the aforementioned pulsation interval distribution value load diagnosis rule which were computed by the aforementioned pulsation interval distribution value calculation means.

[0011] Invention of a claim 4 is operating-duty judging equipment according to claim 1 to 3. the aforementioned operator state detection equipment A pulsation interval detection means to detect an operator's pulsation interval, and the pulsation frequency analysis means which carries out frequency analysis of the pulsation interval for every predetermined time based on the pulsation interval detected by the aforementioned pulsation interval detection means, It has a pulsation frequency-ratio calculation means to compute the ratio of the high frequency component which exceeds predetermined frequency from the result of the frequency analysis by the aforementioned pulsation frequency analysis means, and the low-frequency component which is less than predetermined frequency. The load diagnosis rule held at the aforementioned diagnosis rule storage It is the pulsation frequency-ratio load diagnosis rule which classifies an operator's operating-duty condition according to the degree based on an operator's pulsation frequency ratio. It is characterized by having a pulsation frequency load judging means to judge an operator's loaded condition, based on the pulsation frequency ratio and the aforementioned pulsation frequency-ratio load diagnosis rule which were computed by the aforementioned pulsation frequency-ratio calculation means.

[0012] Invention of a claim 5 is operating-duty judging equipment according to claim 1 to 4. the aforementioned operator state detection equipment The load diagnosis rule which has a respiratory frequency detection means to detect an operator's respiratory frequency, and was held at the aforementioned diagnosis rule storage It is a respiratory frequency load diagnosis rule for classifying an operator's operating-duty condition according to the degree based on an operator's respiratory frequency. It is characterized by having a respiratory frequency average load judging means to judge an operator's loaded condition, based on the respiratory frequency and the aforementioned respiratory frequency load diagnosis rule which were detected by the aforementioned respiratory frequency detection means.

[0013] Invention of a claim 6 is operating-duty judging equipment according to claim 1 to 5. the aforementioned operator state detection equipment It has a respiratory frequency detection means to detect an operator's respiratory frequency, and a respiratory frequency-dispersion value calculation

means to compute the distributed value of the respiratory frequency for every predetermined time based on the respiratory frequency detected by the aforementioned respiratory frequency detection means. The load diagnosis rule held at the aforementioned diagnosis rule storage It is a respiratory frequency-dispersion value load diagnosis rule for classifying an operator's operating-duty condition based on an operator's respiratory frequency-dispersion value. It is characterized by having a respiratory frequency-dispersion value load judging means to judge an operator's loaded condition, based on the respiratory frequency-dispersion value and the aforementioned respiratory frequency-dispersion value load diagnosis rule which were computed by the aforementioned respiratory frequency-dispersion value calculation means.

[0014] Invention of a claim 7 is operating-duty judging equipment according to claim 1 to 6. the aforementioned load judgment means When judged with an operating duty being high based on the result of the operating-duty judging by the aforementioned respiratory frequency average load judging means, and the result of the operating-duty judging by the aforementioned respiratory frequency-dispersion value load judging means When an operator's operating-duty condition is classified into a physical load and an operating duty is judged to be a low, it is characterized by classifying an operator's operating-duty condition into a mental load.

[0015] The operation support equipment which invention of a claim 8 is operating-duty judging equipment according to claim 1 to 7, and performs all or a part of actions required for vehicles operation, The operation support principle storage holding the operation support principle according to the mental or physical operating-duty state, It carries out having an operation support device control means to determine starting of the aforementioned operation support equipment, a halt, and operating state based on the operation support principle held at the judgment of the aforementioned comprehensive operating-duty judging means, and the aforementioned operation support principle storage as the feature.

[0016] Invention of a claim 9 is operating-duty judging equipment according to claim 8. the aforementioned operation support equipment The automatic run control means of vehicles which perform automatically all or a part of operation required for vehicles operation based on the aforementioned operation support device control means, It is based on the aforementioned operation support device control means. The **** ratio adjustable steersman stage which can change a **** ratio, The driving force property adjustable drive control means in which as opposed to an accelerator control input based on the aforementioned operation support device control means can change throttle gain, It is characterized by having at least one or more of the damping characteristic adjustable braking control means which can change the damping force to the amount of brakes operation based on the aforementioned operation support device control means, and the information offer meanses to offer alarm information based on the aforementioned operation support device control means.

[0017]

[Effect of the Invention] According to invention according to claim 1, it becomes possible to obtain the operating-duty data in which an operator's loaded condition is shown by referring to the load diagnosis rule which associated the inclination of a biomedical signal and an operator's loaded condition which were made to measure one kind of an operator's biomedical signal, and were measured with operator state detection equipment. Furthermore, the judgment of an operator's loaded condition based on an operator's loaded condition based on two or more operator load datas which two or more operator state detection equipments outputted, i.e., two or more biomedical signals, is attained by establishing a comprehensive operating-duty judging means to judge an operator's loaded condition based on two or more operator load datas.

[0018] It sets for a comprehensive operating-duty judging means by making the comprehensive operating-duty diagnosis rule which related two or more operator load datas with an operator's mental load and physical load hold inside comprehensive operating-duty diagnosis rule storage in addition to the effect of the invention of a claim 1 according to invention according to claim 2. It becomes possible to judge the operating duty classified into the mental load and the physical load to two or more operating-duty entries of data.

[0019] According to invention according to claim 3, in addition to a claim 1 or the effect of the invention of 2, a pulsation interval detection means is made to detect an operator's pulsation interval,

and making the pulsation intervals for a predetermined time collect enables it to compute the distributed value of a pulsation interval with a pulsation interval distribution value calculation means. Furthermore, with a pulsation interval distribution value load judging means, the judgment of the operating duty to the input of an operator's pulsation signal is suitably attained by referring to diagnosis rule rule equipment by making the pulsation interval distribution value load diagnosis rule which classifies and shows the distributed value of a pulsation interval, and the relation of an operating duty to diagnosis rule storage hold.

[0020] According to invention according to claim 4, in addition to a claim 1 or the effect of the invention of 3, a pulsation interval detection means is made to detect an operator's pulsation interval, and it becomes possible with a pulsation frequency analysis means to perform frequency analysis of a pulsation interval by collecting the pulsation intervals for a predetermined time. It becomes possible to compute the ratio of the low-frequency component and high frequency component which are extracted by frequency analysis by establishing a pulsation frequency-ratio calculation means. Furthermore, with a pulsation frequency-ratio load judging means, the judgment of the operating duty to the input of an operator's pulsation signal is suitably attained by referring to diagnosis rule storage by making the pulsation frequency-ratio load diagnosis rule which classifies and shows a pulsation frequency ratio and the relation of an operating duty to diagnosis rule storage hold.

[0021] According to invention according to claim 5, it adds to a claim 1 or the effect of the invention of 4. By making a respiratory frequency detection means detect an operator's respiratory frequency, and making the respiratory frequency load diagnosis rule which classifies and shows the relation between respiratory frequency and an operating duty to diagnosis rule storage hold With a respiratory frequency load judging means, the judgment of the operating duty to the input of an operator's respiratory signal is suitably attained by referring to diagnosis rule storage.

[0022] According to invention according to claim 6, in addition to a claim 1 or the effect of the invention of 5, a respiratory frequency detection means is made to detect an operator's respiratory frequency, and it becomes possible with a respiratory frequency-dispersion value calculation means to compute the distributed value of respiratory frequency by making the respiratory frequency for a predetermined time collect. Furthermore, with a respiratory frequency-dispersion value load judging means, the judgment of the operating duty to the input of an operator's respiratory signal is suitably attained by referring to diagnosis rule storage by making the respiratory frequency-dispersion value load diagnosis rule which classifies and shows the relation between the distributed value of respiratory frequency, and an operating duty to diagnosis rule storage hold.

[0023] Moreover, according to invention according to claim 7, in addition to a claim 1 or the effect of the invention of 6, it sets for a load judgment means. From the operating-duty judging result of a respiratory frequency load judging means, and the operating-duty judging result of a respiratory frequency-dispersion value load judging means, when it is a judgment that an operating duty is high It becomes possible by classifying an operator's operating-duty condition into a physical load, and classifying an operator's operating-duty condition into a mental load, when an operating duty is the judgment with a low to realize the partition of the mental load of an operating duty, and a physical load.

[0024] According to invention according to claim 8, at an operation support device control unit, it becomes possible to determine suitably starting, a halt, and the operating state of operation support equipment which perform all or a part of action required for vehicles operation based on the judgment of a comprehensive operating-duty judging means by making the operation support principle which shows the operation support suitable for a mental or physical operating-duty state to operation support principle storage hold in addition to a claim 1 or the effect of the invention of 7.

[0025] According to invention according to claim 9, it adds to the effect of the invention of a claim 8. to operation support equipment Automatic run control means, The **** ratio adjustable steersman stage, driving force property adjustable drive control means, and damping characteristic adjustable braking control means, at least one or more meanses with an information offer means are made to hold, and it becomes possible by resembling an operator's mental and physical load situation to that extent, responding and driving these to mitigate an operator's operating duty

[0026]

[Embodiments of the Invention] Drawing 1 is the block diagram showing the composition of this

invention. Like this drawing 1 , the operating-duty judging equipment of this invention is equipped with any of the operator state detection equipments 20A, 20B, 20C, and 20D they are. Moreover, it has the diagnosis rule storage 10, the comprehensive operating-duty judging means 30, the comprehensive operating-duty diagnosis rule storage 80, the operation support device control means 50, the operation support principle storage 60, and operation support equipment 70.

[0027] The aforementioned diagnosis rule storage 10 is related with an operator's biomedical signal inclination and an operator's loaded condition, and holds the load diagnosis rule 11, i.e., a pulsation interval distribution value load diagnosis rule, the pulsation frequency-ratio load diagnosis rule 12, the respiratory frequency load diagnosis rule 13, or the respiratory frequency-dispersion value load diagnosis rule 14.

[0028] The aforementioned operator state detection equipments 20A, 20B, 20C, and 20D memorize one kind of an operator's biomedical signal, and output an operator load data based on the load diagnosis rules 11, 12, 13, and 14 held at this biomedical signal and the aforementioned diagnosis rule storage 10.

[0029] Moreover, the aforementioned operator state detection equipment 20A is equipped with the pulsation interval detection means 211, the pulsation interval distribution value calculation means 212, and the pulsation interval distribution value load judging means 213. The aforementioned pulsation interval detection means 211 detects an operator's pulsation interval. The aforementioned pulsation interval distribution value calculation means 212 computes the distributed value of the pulsation interval for every predetermined time based on the pulsation interval detected by the pulsation interval detection means 211. The aforementioned pulsation interval distribution value load judging means 213 judges an operator's loaded condition based on the pulsation interval distribution value load diagnosis rule 11 as a load diagnosis rule held at the distributed value of a pulsation interval and the aforementioned diagnosis rule storage 10 which were computed by the aforementioned pulsation interval distribution value calculation means 212.

[0030] The aforementioned operator state detection equipment 20B is equipped with the pulsation interval detection means 211, the pulsation frequency analysis means 212, the pulsation frequency-ratio calculation means 223, and the pulsation frequency-ratio load judging means 224. The aforementioned pulsation interval detection means 211 detects an operator's pulsation interval. The aforementioned pulsation frequency analysis means 212 carries out frequency analysis of the pulsation interval for every predetermined time based on the pulsation interval detected by the pulsation interval detection means 221. The aforementioned pulsation frequency-ratio calculation means 223 computes the ratio of the high frequency component which exceeds predetermined frequency from the result of the frequency analysis by the aforementioned pulsation frequency analysis means 222, and the low-frequency component which is less than predetermined frequency. The aforementioned pulsation frequency-ratio load judging means 224 judges an operator's loaded condition based on the pulsation frequency-ratio load diagnosis rule 12 as a judgment load principle held at the pulsation frequency ratio and the aforementioned diagnosis rule storage which were computed by the aforementioned pulsation frequency-ratio calculation means 223.

[0031] The aforementioned operator state detection equipment 20C is equipped with the respiratory frequency detection means 231 and the respiratory frequency average load judging means 232. The aforementioned respiratory frequency detection means 231 detects an operator's respiratory frequency. The aforementioned respiratory frequency average load judging means 232 judges an operator's loaded condition based on the respiratory frequency load diagnosis rule 13 as a load diagnosis rule held at the respiratory frequency and the aforementioned diagnosis rule storage 10 which were detected by the aforementioned respiratory frequency detection means 231.

[0032] The aforementioned operator state detection equipment 20D is equipped with the respiratory frequency detection means 241, the respiratory frequency-dispersion value calculation means 242, and the respiratory frequency-dispersion value load judging means 243. The aforementioned respiratory frequency detection means 241 detects an operator's respiratory frequency. The aforementioned respiratory frequency-dispersion value calculation means 242 computes the distributed value of the respiratory frequency for every predetermined time based on the respiratory frequency detected by the aforementioned respiratory frequency detection means 241. The aforementioned respiratory frequency-dispersion value load judging means 243 judges an operator's

loaded condition based on the respiratory frequency-dispersion value load diagnosis rule 14 as a load diagnosis rule held at the respiratory frequency-dispersion value and the aforementioned diagnosis rule storage 10 which were computed by the aforementioned respiratory frequency-dispersion value calculation means 242.

[0033] The aforementioned comprehensive operating-duty judging means 30 is equipped with the load judgment means 40. Based on the result of the operating-duty judging by the aforementioned respiratory frequency average load judging means 232 and the respiratory frequency-dispersion value load judging means 243, the load judgment means 40 classifies an operator's operating-duty condition into a physical load, when judged with an operating duty being high, and when an operating duty is judged to be a low, it classifies an operator's operating-duty condition into a mental load.

[0034] The aforementioned comprehensive operating-duty diagnosis rule storage 80 is equipped with the comprehensive operating-duty diagnosis rule 81. The aforementioned comprehensive operating-duty diagnosis rule 81 describes the principle which classifies an operator's operating-duty condition into a mental load and a physical load based on two or more operator load datas. The aforementioned operation support equipment 70 performs all or a part of actions required for vehicles operation. The operation support principle 61 according to the operating-duty state mental [the aforementioned operation support principle storage 60] or physical is held.

[0035] The aforementioned operation support device control means 50 determines starting of the aforementioned operation support equipment 70, a halt, and operating state based on the operation support principle 61 held at the comprehensive operating-duty judging means 30 and the operation support principle storage 60.

[0036] The aforementioned operation support equipment 70 is equipped with the automatic run control means 71, the **** ratio adjustable steersman stage 72, the driving force property adjustable drive control means 73, the damping characteristic adjustable braking control means 74, and the information offer means 75. The aforementioned automatic run control means 71 perform automatically all or a part of operation required for vehicles operation based on the operation support device control means 50. The aforementioned **** ratio adjustable steersman stage 72 changes a **** ratio based on the operation support device control means 50. The aforementioned driving force property adjustable drive control means 73 change throttle gain over an accelerator control input based on the aforementioned operation support device control means 50. The aforementioned damping characteristic adjustable braking control means 74 change the damping force to the amount of brakes operation based on the aforementioned operation support device control means 50. The aforementioned information offer means 75 offers alarm information based on the aforementioned operation support device control means.

[0037] (The 1st operation gestalt) Drawing 2 shows the block diagram concerning the 1st operation gestalt of this invention. Like this drawing 2 , the operating-duty judging equipment of the 1st operation gestalt is equipped with electrocardio signal-detection equipment 100, the pulsation interval distribution value calculation circuit 101, the pulsation interval distribution value load judging circuit 102, the pulsation frequency analysis circuit 103, and the pulsation frequency-ratio load judging circuit 104. Moreover, it has respiratory signal-detection equipment 105, the respiratory frequency averaging circuit 106, the respiratory frequency average load judging circuit 107, the respiratory frequency-dispersion value calculation circuit 108, and the respiratory frequency-dispersion value load judging circuit 109. Furthermore, it has the comprehensive operating-duty judging circuit 110, the operation support device control circuit 111, the automatic run control unit 112, information offer equipment 113, the load diagnosis rule storage 114, and the operation support principle storage 115.

[0038] The aforementioned electrocardio signal-detection equipment 100 constitutes the aforementioned pulsation interval detection means 211, and detects an operator's heartbeat signal. The aforementioned pulsation interval distribution value calculation circuit 101 constitutes the aforementioned pulsation interval distribution value calculation means 212, and computes a distributed value in quest of a pulsation interval from the detected heartbeat signal. The aforementioned pulsation interval distribution value load judging circuit 102 constitutes the aforementioned pulsation interval distribution value load judging means 213, and an operator's

operating duty is judged by comparing the computed pulsation interval distribution value with the diagnosis rule memorized by the load diagnosis rule storage 114. The aforementioned pulsation frequency analysis circuit 103 constitutes the aforementioned pulsation frequency analysis means 212, asks for a pulsation interval from the detected heartbeat signal, and after it amends this to the data of a fixed sampling frequency, it performs frequency analysis.

[0039] An operator's operating duty is judged by the aforementioned pulsation frequency-ratio load judging circuit 104 constituting the aforementioned pulsation frequency-ratio calculation means 223 and the pulsation frequency-ratio load judging means 224, asking for the ratio of the high frequency component and low-frequency component which were obtained as a result of frequency analysis, and comparing the computed ratio with the diagnosis rule memorized by the load diagnosis rule storage 114.

[0040] The aforementioned respiratory signal-detection equipment 105 constitutes the aforementioned respiratory frequency detection means 231, and detects an operator's respiratory signal. The aforementioned respiratory frequency averaging circuit 106 constitutes the aforementioned respiratory frequency detection means 231, and computes the average in quest of respiratory frequency from the detected respiratory signal.

[0041] The aforementioned respiratory frequency average load judging circuit 107 constitutes the aforementioned respiratory frequency average load judging means 232, and an operator's operating duty is judged by comparing the computed respiratory frequency average with the diagnosis rule memorized by the load diagnosis rule storage means 114.

[0042] The aforementioned respiratory frequency distribution value calculation circuit 108 constitutes the aforementioned respiratory frequency distribution value calculation means 242, and computes the distributed value in quest of respiratory frequency from the detected respiratory signal. The aforementioned respiratory frequency distribution value load judging circuit 109 constitutes the aforementioned respiratory frequency distribution value load judging means 243, and an operator's operating duty is judged by comparing the computed respiratory frequency distribution value with the diagnosis rule memorized by the load diagnosis rule storage means 114.

[0043] The aforementioned comprehensive operating-duty judging circuit 110 constitutes the aforementioned comprehensive operating-duty judging means 30, and the kind and grade of an operating duty of an operator are judged by comparing the judgment result of each judgment circuit 100,204,107,109 with the diagnosis rule memorized by the load diagnosis rule storage 114.

[0044] The aforementioned operation support device control circuit 111 constitutes the aforementioned operation support device control means 50, and need judgment of operation support of an operator and the support method are determined by comparing the kind and grade of the judged operating duty with the support principle memorized by the operation support principle storage 115.

[0045] The aforementioned automatic run control unit 112 constitutes the aforementioned automatic run control means 71, and performs automatically each of steering control, accelerator control, and brake control. The aforementioned information offer equipment 113 constitutes the aforementioned information offer means 75, and shows an operator alarm information by voice and the picture.

[0046] Since an exact wave diagnosis of electrocardio is not the purpose, as the heartbeat signal which detects the pulsation of the heart and is detected with an ultrasonic sensor is shown in drawing 3 , detection of a heartbeat signal is possible for the aforementioned heartbeat signal-detection equipment 100 by building this ultrasonic sensor 91 in a sheet 92. Moreover, as breathing movement is detected as a wave by expansion and contraction of the strain gage arranged to the thorax and it is shown in drawing 3 , detection of a respiratory signal is possible for the aforementioned respiratory signal-detection equipment 105 by building the respiratory sensor 93 in a seat belt 90.

[0047] Although the RRV calculation technique performed by the real time can be used for processing performed in the aforementioned pulsation interval distribution value calculation circuit 101, an example of the calculation method is explained using the flow chart shown in drawing 4 . At Step S11, the heartbeat signal detected by heartbeat signal-detection equipment 100 is inputted. At Step S12, the threshold given beforehand detects the R wave of a heartbeat signal. At Step S13, the time interval RRI (R-R Interval) of R wave detection is computed. At Step S14, the RRI data for the past 30 seconds which newly added the RRI data computed at Step S13 are accumulated for the data accumulation means in a circuit. At Step S15, the normalization distribution RRV is computed about

the RRI data for 30 accumulated seconds. According to this method, although RRV exact about for 30 seconds after a measurement start is uncomputable, RRV based on the heartbeat signal for 30 seconds will be computed to the timing by which an R wave is detected after 30-second progress. Calculated RRV is outputted at Step S16.

[0048] It explains using the flow chart which shows the flow of the processing performed in the aforementioned pulsation interval distribution value judging circuit 102 to drawing 5 . The pulsation interval distribution value RRV computed by the pulsation interval distribution value calculation circuit 101 at Step S17 is inputted. At Step S18, the grade of an operating duty is computed with reference to the load diagnosis rule storage 114. When the pulsation interval distribution value which shows the relation between a pulsation interval distribution value and an operating duty to the load diagnosis rule storage 114 and which the table shown in drawing 6 is memorized, for example, was inputted at Step S17 is rrv=2x10-4, operating-duty stage WLrrv=4 are obtained. In addition, the relation of the pulsation interval distribution value and operating duty which are shown in this table can use what analyzed statistically the result which is a subject's subjectivity, for example, estimated the grade of the load in five stages as the pulsation interval distribution value shown when a load is experimentally given to two or more subjects (operator). At Step S19, the operating duty for which it asked is outputted as operator load-data WLrrv.

[0049] It explains using the flow chart which shows the flow of the processing performed in the aforementioned pulsation frequency analysis circuit 103 to drawing 7 . At Step S21, the heartbeat signal detected by heartbeat signal-detection equipment 100 is inputted. At Step S22, the threshold given beforehand detects the R wave of a heartbeat signal. At Step S23, the time interval RRI (R-R Interval) of R wave detection is computed. At Step S24, computed RRI was newly added, for example, the RRI data for 32 seconds are accumulated. At Step S25, it interpolates by 4Hz about the RRI data for 32 accumulated seconds. This is because RRI data become a serially irregular sampling. At Step S26, high-speed frequency analysis FFT is performed based on the complemented data. If it depends on this method, although frequency analysis exact about for [of the start] 32 seconds cannot be performed, FFT of 128 points can be carried out to the timing as which an R wave is detected after 32-second progress. The result of frequency analysis is outputted at Step S27.

[0050] It explains using the flow chart which shows the flow of the processing performed in the aforementioned pulsation frequency-ratio judging circuit 104 to drawing 8 . The frequency analysis result computed by the pulsation frequency analysis circuit 103 at Step S28 is inputted. It asks for the low-frequency component LF and high frequency component HF of an analysis result at Step S29. What is necessary is for a low-frequency component LF to be a component of blood-pressure variability, and just to set the peak point around 0.1Hz to LF, since it turns out that it appears before and after 0.1Hz. A high frequency component HF is a component of respiratory variability, and if vehicles are on stream, it turns out that it appears after 0.2Hz. Therefore, what is necessary is just to set the peak point after 0.2Hz to HF. the ratio of the low-frequency component LF detected at Step S30, and a high frequency component HF -- LH=LF/HF is computed At Step S31, the grade of an operating duty is computed with reference to the load diagnosis rule storage 114. When LH which the table shown in drawing 9 which shows the relation between the frequency component ratio LH and an operating duty to the load diagnosis rule storage 114 is memorized, for example, was computed is lh=2.9, operating-duty stage WLlh=3 are obtained. In addition, the relation of the frequency component ratio LH and operating duty which are shown in this table can use what analyzed statistically the result which is a subject's subjectivity, for example, estimated the grade of the load in five stages as the frequency component ratio LH shown when a load is experimentally given to two or more subjects (operator). At Step S32, the operating duty for which it asked is outputted as operator load-data WLlh.

[0051] It explains using the flow chart which shows the flow of the processing performed in the aforementioned respiratory frequency calculation circuit 106 to drawing 10 . At Step S41, the respiratory signal detected by respiratory signal-detection equipment 105 is inputted. At Step S42, the respiratory signal for 32 seconds is accumulated, for example. At Step S43, the respiratory signal for 320 seconds which newly added the respiratory signal for 32 seconds accumulated at Step S42 is accumulated. High-speed frequency analysis FFT is performed based on the respiratory signal accumulated at Step S43. According to this method, although frequency analysis exact about for [of

the start] 320 seconds cannot be performed, by the time interval and this example which were set up at Step S42, frequency analysis can be carried out at intervals of 32 seconds after 320-second progress. Respiratory frequency is extracted as a result of this frequency analysis. The respiratory frequency for which it asked is outputted at Step S45.

[0052] It explains using the flow chart which shows the flow of the processing performed in the aforementioned respiratory frequency load judging circuit 107 to drawing 11 . The respiratory frequency computed by respiratory frequency ****** 105 at Step S46 is inputted. At Step S47, the grade of an operating duty is computed with reference to the load diagnosis rule storage 114. The relation between respiratory frequency and an operating duty is shown in the load diagnosis rule storage 114. When the respiratory frequency which the table shown in drawing 12 is memorized, for example, was inputted at Step S46 is r= 0.33 [Hz], operating-duty stage WLr=3 are obtained. In addition, the relation of the respiratory frequency and the operating duty which are shown in this table can use what analyzed statistically the result which is a subject's subjectivity, for example, estimated the grade of the load in five stages as the respiratory frequency shown when a load is experimentally given to two or more subjects (operator). At Step S48, the operating duty for which it asked is outputted as an operator load data WLr.

[0053] It explains using the flow chart which shows the flow of the processing performed in the aforementioned respiratory frequency-dispersion value calculation circuit 108 to drawing 13 . At Step S51, the respiratory signal detected by respiratory signal-detection equipment 105 is inputted. At Step S52, the respiratory signal for 32 seconds is accumulated, for example. At Step S53, high-speed frequency analysis FFT is performed based on the accumulated respiratory signal. Respiratory frequency is extracted as a result of this frequency analysis. At Step S54, the respiratory frequency for 320 seconds which newly applied the computed respiratory frequency is accumulated. The distributed value of the accumulated respiratory frequency is calculated at Step S55. According to this method, although the distributed value of respiratory frequency exact about for [of the start] 320 seconds cannot be calculated, it is possible after 320-second progress to calculate the distributed value of respiratory frequency at intervals of the time interval set up at Step S26 and 32 seconds. The calculated respiratory frequency-dispersion value is outputted at Step S56.

[0054] It explains using the flow chart which shows the flow of the processing performed in the aforementioned respiratory frequency-dispersion value load judging circuit 109 to drawing 14 . The respiratory frequency-dispersion value computed by the respiratory frequency-dispersion value calculation circuit 108 at Step S57 is inputted. At Step S58, the grade of an operating duty is computed with reference to the load diagnosis rule storage 114. When the respiratory frequency-dispersion value which the table of drawing 15 showing the relation between a respiratory frequency-dispersion value and an operating duty is memorized by the load diagnosis rule storage 114, for example, was inputted into it at Step S57 is rv=0.012, operating-duty stage WLbv=2 are obtained. In addition, the relation of the respiratory frequency-dispersion value and operating duty which are shown in this table can use what analyzed statistically the result which is a subject's subjectivity, for example, estimated the grade of the load in five stages as the respiratory frequency-dispersion value shown when a load is experimentally given to two or more subjects (operator). At Step S59, the operating-duty stage searched for is outputted as operator load-data WLrv.

[0055] It explains using the flow chart which shows the flow of the processing performed in the aforementioned integrated-load judging circuit 110 to drawing 16 . The operator load data (WLhv, WLlh, WLr, WLrv) judged by Step S61 in each of the pulsation interval distribution value load judging circuit 102, the pulsation frequency-ratio load judging circuit 104, the respiratory frequency load judging circuit 107, and the respiratory frequency-dispersion ****** circuit 109 is inputted. At Step S62, it judges whether it is what belongs each inputted operator load data to three sorts of which operating-duty classification, a "mental load", a "physical load", and usual ["usual"], with reference to the load diagnosis rule storage 114. Each operator load data of a pulsation interval distribution value, a pulsation frequency ratio, respiratory frequency, and a respiratory frequency-dispersion value is memorized by the load diagnosis rule storage 114 as shown in the table showing the typical value shown when each a "mental load", a "physical load", and "usual" is given in drawing 17 . And the mental load value WLm is [Equation 1].

$$WLm = \sqrt{(WLhv-a_{11})^2+(WLlh-a_{12})^2+(WLr-a_{13})^2+(WLrv-a_{14})^2}$$

It comes out and determines. The physical load value WLb is [Equation 2] similarly.

$$WLb = \sqrt{(WLhv - a_{21})^2 + (WLlh - a_{22})^2 + (WLr - a_{23})^2 + (WLrv - a_{24})^2}$$

Coming out and determining, the load value WLn is usually [Equation 3].

$$WLn = \sqrt{(WLhv - a_{31})^2 + (WLlh - a_{32})^2 + (WLr - a_{33})^2 + (WLrv - a_{34})^2}$$

It comes out and determines. For example, it is [Equation 4], when the operating-duty data inputted at Step S61 are = (WLhv, WLlh, WLr, WLrv) (4, 3, 3, 2) and a table is given by drawing 18 .

精神的負荷値

$$WLm = \sqrt{(4-4.5)^2 + (3-4.0)^2 + (3-2.5)^2 + (2-3.0)^2} = 1.58$$

身体的負荷値

$$WLp = \sqrt{(4-4.0)^2 + (3-3.0)^2 + (3-4.5)^2 + (2-4.5)^2} = 2.92$$

通常値

$$WLn = \sqrt{(4-1.0)^2 + (3-1.5)^2 + (3-1.5)^2 + (2-1.5)^2} = 3.71$$

******. According to this technique, what shows the smallest value with each computed load value is close to the state (operating-duty classification) of a load where the operator has set. That is, in this example, the operating-duty classification WLk is judged to be a "mental load." In addition, this table gives three sorts of loads, a "mental load", a "physical load", and usual ["usual"], experimentally to two or more subjects (operator), and can create them by averaging each operator load data shown at this time. At Step S63, the operating-duty level WLl is computed based on the judgment result of Step S62. If a judgment result is a "mental load", let the value of the operating-duty data WLlh based on the pulsation frequency-ratio load judging accepted to reflect the inclination most experimentally be the operating-duty level WLl. On the other hand, if a judgment result is a "physical load", let the value of the operating-duty data WLrv based on the respiratory frequency-dispersion value judging accepted to reflect the inclination most experimentally be the operating-duty level WLl. If a judgment result is "usual", the item of operating-duty level is blank and good. At Step S64, the combination of the operating-duty classification WLk and the operating-duty level WLl is outputted as a comprehensive operating-duty value (WLk, WLl).

[0056] The aforementioned automatic run control means 112 are what performs all or a part in operation concerning vehicles operation automatically. For example, the actuator which drives a distance-between-two-cars sensor, a speed sensor, an accelerator, and a brake is carried. It carries in the so-called automatic cruise control (ACC) which makes it possible to maintain the distance between two cars with precedence vehicles automatically, or to maintain the vehicle speed, and to run, and a camera and a steering actuator. The rain follow-up control equipment which **** and runs a steering wheel automatically with a steering actuator that the run lane detected with the camera should be maintained is equivalent to this. In addition, with this operation gestalt, an automatic cruise control and rain follow-up control equipment are carried.

[0057] With this operation gestalt, the aforementioned information offer equipment 113 serves as the buzzer 95 installed in the arbitrary positions of the vehicle interior of a room shown in time which specified the sound of specific frequency, and the monitor 96 which can present arbitrary pictures, as shown in drawing 19 .

[0058] It explains using the flow chart which shows the flow of the processing performed by the aforementioned operation support control unit control circuit 111 to drawing 20 . At Step S71, the comprehensive operating-duty value which is the combination of operating-duty classification and operating-duty value level outputted from the aforementioned integrated-load judging circuit 110 is inputted. At Step S72, the drive method is determined as the kind of operation support equipment to drive with reference to the operation support principle storage 115. The table of drawing 21 showing the relation of the operation support equipment which is made to correspond to operating-duty classification and operating-duty level, and is driven is memorized, and according to this table, when

the operating-duty classification inputted at Step S71 is a "mental load" and is operating-duty level WLl=3, issuing a drive instruction to the automatic cruise control of the automatic run control unit 112 is shown in the operation support principle storage 115, for example. At this time, displaying the information which tells that an automatic cruise control starts to the monitor of information offer equipment, and sounding the buzzer of information presentation equipment for 0.5 seconds are shown. Moreover, when it is operating-duty level WLl>=4, in addition to an automatic cruise control, rain follow-up control equipment is driven, and displaying the information which tells what the rain follow-up system started on the monitor of information offer equipment, and sounding the buzzer of information offer equipment for 1 second are shown. Moreover, when operating-duty classification is a "physical load" and usual ["usual"], not driving operation support equipment is shown. The relation between the operating-duty classification shown in this table, operating-duty level, and the operation support equipment to drive It asks by carrying out the questionnaire of the support means starting with the subjectivity of the subject when giving a mental load and a physical load to two or more subjects (operator) experimentally. The effect can be checked by comparing with the load level before measuring the operating-duty classification and operating-duty level when furthermore driving operation support equipment and driving operation support equipment. At Step S73, the policy of the operation support determined at Step S72 is implemented.

[0059] The load judgment by the distributed value of the heartbeat interval which is obtained from a heartbeat signal according to this operation gestalt as explained above, The load judgment by the frequency analysis of a pulsation interval, and the load judgment by the respiratory frequency obtained from a respiratory signal, By performing a total of four sorts of plural load judgment of the load judgment by the distributed value of respiratory frequency, and comparing the appearance pattern of each judgment value with the pattern memorized by storage The judgment of the operating duty from plural biomedical signals can be performed, and this operating duty can be further divided into a mental load and a physical load. Therefore, an exact load judging can be performed and exact control of operation support equipment etc. can be performed.

[0060] (The 2nd operation gestalt) Drawing 22 is the block diagram of the 2nd operation gestalt of this invention applied to the operating-duty judging equipment which judges an operator's operating duty. As equipment controlled when offering operation support, this operation gestalt is the example which increased the **** ratio adjustable power steering system 116, the drive property adjustable drive control unit 117, and the damping characteristic adjustable braking control unit 118. It is the example which changed the content of the operation support principle memorized in connection with this by operation support principle storage 115' which operation support device control circuit 111' refers to, and the flow of other composition and the processing in each component is the same as the 1st operation gestalt.

[0061] The aforementioned steering property adjustable steering control unit 116 is a steering control unit which can change the steering gear ratio which determines the amount of steering of the steering wheel to steering of an operator.

[0062] The aforementioned drive property adjustable drive control unit 117 is a drive control unit which can change, the gain, i.e., the throttle gain, of the opening of a throttle valve to an operator's accelerator control input.

[0063] The aforementioned damping characteristic adjustable braking control unit 118 is a braking control unit in which change of damping force which makes it generate to an operator's brake treading strength or amount of brake trodding is possible, and is the so-called brake assistant equipment.

[0064] It explains using the flow chart which shows the flow of the processing performed by aforementioned operation support control unit control circuit 111' to drawing 23 . At Step S81, the comprehensive operating-duty value which is the combination of operating-duty classification and operating-duty value level outputted from the integrated-load judging circuit 110 is inputted. At Step S82, the drive method is determined as the kind of operation support equipment to drive with reference to operation support principle storage 115'. The table showing the relation of the operation support equipment which is made to correspond to operating-duty classification and operating-duty level, and is driven shown in drawing 24 is memorized by operation support principle storage 115', and when the operating-duty classification inputted at Step S71 is a "mental load" and is operating-

duty level WLl=4, according to this table, issuing a drive instruction to the automatic cruise control of the automatic run control unit 112 is shown, for example. At this time, displaying the information which tells that an automatic cruise control starts to the monitor of information offer equipment, and sounding the buzzer of information offer equipment for 0.5 seconds are shown. Moreover, the steer ring gear ratio is set up 0.9 times at the time, and 0.95 times at the time and the amount of brake assistance are usually set up 1.05 usual times for throttle gain. In addition, the vehicles property of rapid behavior originates in sensing troublesome and delay usually arising in braking operation as compared with the time as a state of mind of an operator when the load with this mental setup is imposed.

[0065] Moreover, when the operating-duty classification inputted at Step S71 is a "physical load" and is operating-duty level WLl=5 for example, the steer ring gear ratio is set up 1.5 times at the time, and 1.1 times at the time and the amount of brake assistance are usually set up 1.15 usual times for throttle gain. In addition, this setup originates in wanting to usually perform various operations in a hurry as a trial condition of an operator when the physical load is imposed as compared with the time, and that a control input wants to decrease. Furthermore, in being usually at the time, it shows not driving operation support equipment.

[0066] The relation between the operating-duty classification shown in this table, operating-duty level, and the operation support equipment to drive It asks by carrying out the questionnaire of the support means starting with the subjectivity of the subject when giving a mental load and a physical load to two or more subjects (operator) experimentally. The effect can be checked by comparing with the load level before measuring the operating-duty classification and operating-duty level when furthermore driving operation support equipment and driving operation support equipment. At Step S83, the policy of the operation support determined at Step S82 is implemented.

[0067] The load judgment by the distributed value of the pulsation interval which is obtained from a heartbeat signal according to this operation form as explained above, The result synthetically judged based on a total of four sorts of load judgment of the load judgment by the frequency analysis of a pulsation interval, and the load judgment by the distributed value of the respiratory frequency obtained from a respiratory signal, Distinction is made by a mental load and the physical load in an operating duty, and an operation support means to have been suitable for an operator's loaded condition can be chosen and carried out by computing each load level further.

[0068] In addition, although judged with a heartbeat and the both sides of breathing with the above-mentioned operation form, judging only using a heartbeat and one of breathing is also possible.

[Translation done.]

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] Operating-duty judging equipment characterized by providing the following. Diagnosis rule storage which associated an operator's biomedical signal inclination and an operator's loaded condition, and was held as a load diagnosis rule. Operator state detection equipment which outputs an operator load data based on the aforementioned load diagnosis rule which measured one kind of an operator's biomedical signal, and was held at this biomedical signal and the aforementioned diagnosis rule storage. A comprehensive operating-duty judging means to judge an operator's loaded condition based on two or more operator load datas which the aforementioned operator state detection equipment outputted.
[Claim 2] Are operating-duty judging equipment according to claim 1, and it is based on two or more aforementioned operator load datas. It has the comprehensive operating-duty diagnosis rule storage holding the comprehensive operating-duty diagnosis rule which classifies an operator's operating-duty condition into a mental load and a physical load. the aforementioned comprehensive operating-duty judging means Operating-duty judging equipment characterized by having a load judgment means to classify the judgment of an operating-duty state into a mental load and a physical load, and to perform it, based on two or more aforementioned operating-duty data and the aforementioned comprehensive operating-duty diagnosis rule.
[Claim 3] Operating-duty judging equipment according to claim 1 or 2 characterized by providing the following. The aforementioned operator state detection equipment is a pulsation interval detection means to detect an operator's pulsation interval. It has a pulsation interval distribution value calculation means to compute the distributed value of the pulsation interval for every predetermined time based on the pulsation interval detected by the aforementioned pulsation interval detection means. The load diagnosis rule held at the aforementioned diagnosis rule storage It is the pulsation interval distribution value load diagnosis rule which classifies an operator's operating-duty condition according to the degree based on an operator's pulsation interval distribution value. A pulsation interval distribution value load judging means to judge an operator's loaded condition based on the distributed value of a pulsation interval and the aforementioned pulsation interval distribution value load diagnosis rule which were computed by the aforementioned pulsation interval distribution value calculation means.
[Claim 4] Operating-duty judging equipment according to claim 1 to 3 characterized by providing the following. The aforementioned operator state detection equipment is a pulsation interval detection means to detect an operator's pulsation interval. The pulsation frequency analysis means which carries out frequency analysis of the pulsation interval for every predetermined time based on the pulsation interval detected by the aforementioned pulsation interval detection means. It has a pulsation frequency-ratio calculation means to compute the ratio of the high frequency component which exceeds predetermined frequency from the result of the frequency analysis by the aforementioned pulsation frequency analysis means, and the low-frequency component which is less than predetermined frequency. The load diagnosis rule held at the aforementioned diagnosis rule storage It is the pulsation frequency-ratio load diagnosis rule which classifies an operator's operating-duty condition according to the degree based on an operator's pulsation frequency ratio. A pulsation frequency load judging means to judge an operator's loaded condition based on the pulsation frequency ratio and the aforementioned pulsation frequency-ratio load diagnosis rule which

were computed by the aforementioned pulsation frequency-ratio calculation means.
[Claim 5] It is operating-duty judging equipment according to claim 1 to 4. the aforementioned operator state detection equipment The load diagnosis rule which has a respiratory frequency detection means to detect an operator's respiratory frequency, and was held at the aforementioned diagnosis rule storage It is a respiratory frequency load diagnosis rule for classifying an operator's operating-duty condition according to the degree based on an operator's respiratory frequency. Operating-duty judging equipment characterized by having a respiratory frequency average load judging means to judge an operator's loaded condition, based on the respiratory frequency and the aforementioned respiratory frequency load diagnosis rule which were detected by the aforementioned respiratory frequency detection means.
[Claim 6] Operating-duty judging equipment according to claim 1 to 5 characterized by providing the following. The aforementioned operator state detection equipment is a respiratory frequency detection means to detect an operator's respiratory frequency. It has a respiratory frequency distribution value calculation means to compute the distributed value of the respiratory frequency for every predetermined time based on the respiratory frequency detected by the aforementioned respiratory frequency detection means. The load diagnosis rule held at the aforementioned diagnosis rule storage It is a respiratory frequency distribution value load diagnosis rule for classifying an operator's operating-duty condition based on an operator's respiratory frequency distribution value. A respiratory frequency distribution value load judging means to judge an operator's loaded condition based on the respiratory frequency distribution value and the aforementioned respiratory frequency distribution value load diagnosis rule which were computed by the aforementioned respiratory frequency distribution value calculation means.
[Claim 7] It is operating-duty judging equipment according to claim 1 to 6. the aforementioned load judgment means When judged with an operating duty being high based on the result of the operating-duty judging by the aforementioned respiratory frequency average load judging means, and the result of the operating-duty judging by the aforementioned respiratory frequency distribution value load judging means Operating-duty judging equipment characterized by classifying an operator's operating-duty condition into a mental load when an operator's operating-duty condition is classified into a physical load and it is judged with an operating duty being low.
[Claim 8] Operating-duty judging equipment according to claim 1 to 7 characterized by providing the following. Operation support equipment which performs all or a part of actions required for vehicles operation. Operation support principle storage holding the operation support principle according to the mental or physical operating-duty state. An operation support device control means to determine starting of the aforementioned operation support equipment, a halt, and operating state based on the operation support principle held at the judgment of the aforementioned comprehensive operating-duty judging means, and the aforementioned operation support principle storage.
[Claim 9] Operating-duty judging equipment according to claim 8 characterized by providing the following. The aforementioned operation support equipment is automatic run control means of vehicles which perform automatically all or a part of operation required for vehicles operation based on the aforementioned operation support device control means. It is based on the aforementioned operation support device control means, and is the **** ratio adjustable steersman stage which can change a **** ratio. Driving force property adjustable drive control means in which as opposed to an accelerator control input based on the aforementioned operation support device control means can change throttle gain. At least one or more of the damping characteristic adjustable braking control means which can change the damping force to the amount of brakes operation based on the aforementioned operation support device control means, and the information offer meanses to offer alarm information based on the aforementioned operation support device control means

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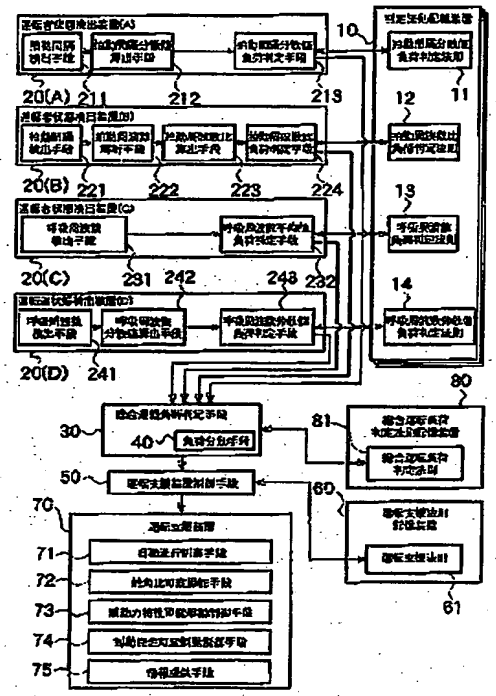
[Translation done.]

【図１】



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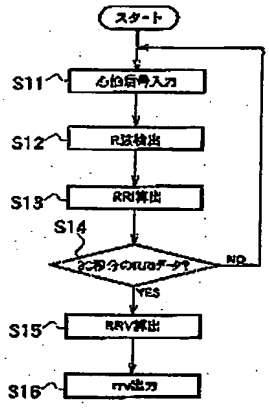

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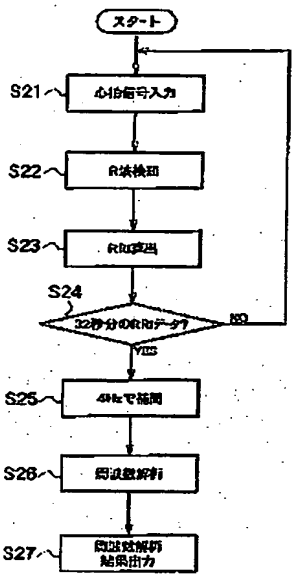

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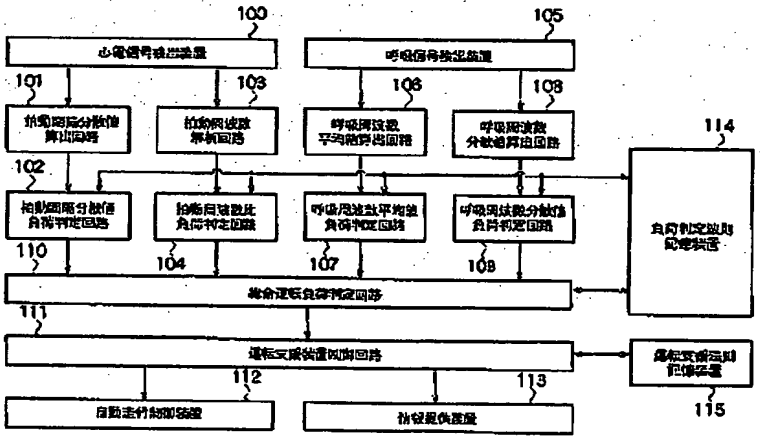

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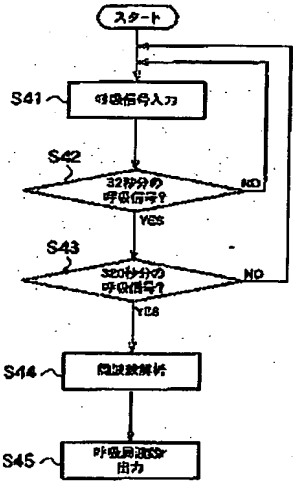

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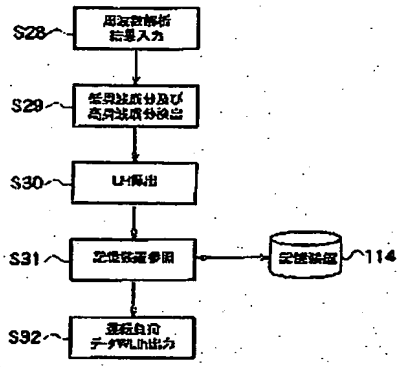


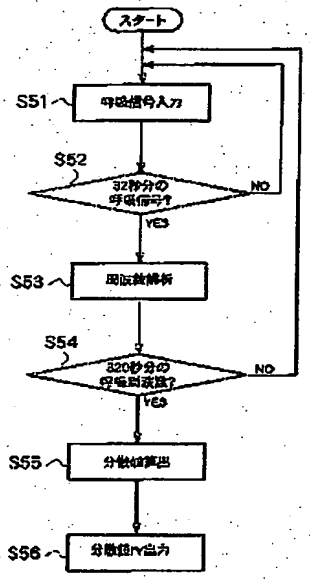
【図９】

LH	WLh
lh≧6.0	5
6.0>lh≧3.3	4
3.3>lh≧2.0	3
2.0>lh≧1.0	2
1.0>lh	1

【図１２】

呼吸周波数	WLr
r≧0.68	5
0.68>r≧0.55	4
0.55>r≧0.31	3
0.31>r≧0.25	2
0.25>r	1

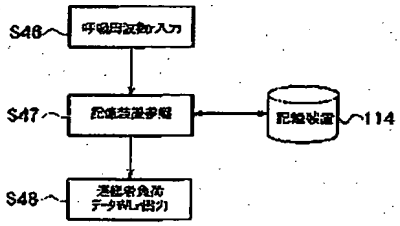
【図１３】



【図１５】

呼吸周波数分散値	WLrv
rv≧0.064	5
0.064>rv≧0.038	4
0.038>rv≧0.016	3
0.016>rv≧0.004	2
0.004>rv	1

【図１１】



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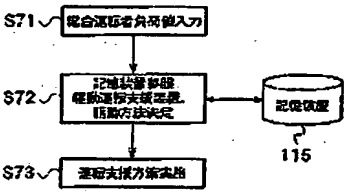

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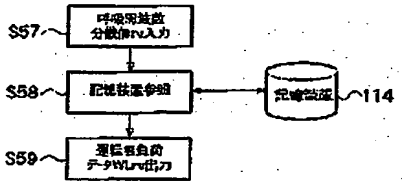

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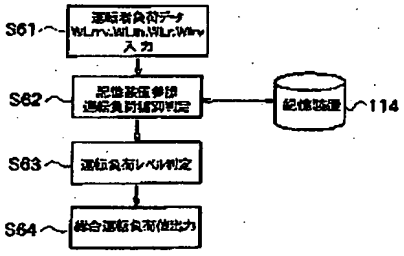

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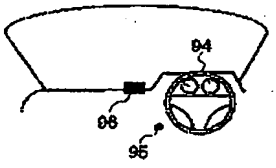


【図１７】

精神的負荷時WLm	a11	a12	a13	a14
身体的負荷時WLp	a21	a22	a23	a24
通常時WLn	a31	a32	a33	a34

【図１８】

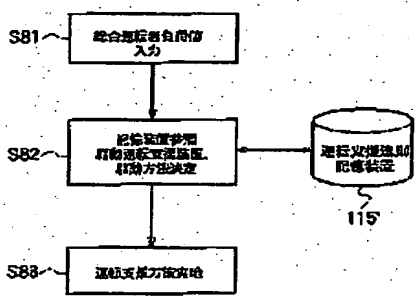
精神的負荷時WLm	4.5	4.0	2.5	3.5
身体的負荷時WLp	4.0	5.0	4.5	4.5
通常時WLn	1.0	1.5	1.5	1.5

【図２１】

WLK \ WLI	5	4	3	2	1
精神負荷	ON	ON	OFF	OFF	OFF
	ON	OFF	OFF	OFF	OFF
	レーン逸脱警報作動	ACC作動	1段目	OFF	OFF
	ON(1秒)	ON(0.5秒)	OFF	OFF	OFF
身体負荷	OFF	OFF	OFF	OFF	OFF
	OFF	OFF	OFF	OFF	OFF
	OFF	OFF	OFF	OFF	OFF
	OFF	OFF	OFF	OFF	OFF
通常時	OFF				
	OFF				
	OFF				
	OFF				

1段目	ACC動作状態
2段目	レーン逸脱警報動作状態
3段目	モニタへの表示内容
4段目	ブザー吹鳴作状態

【図２３】



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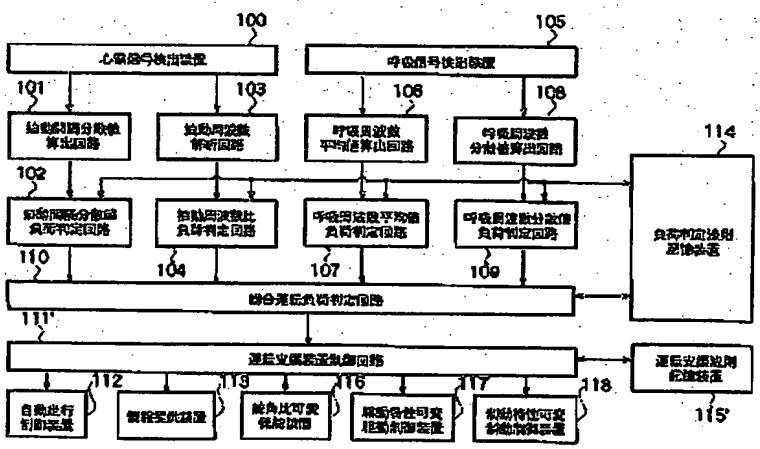

【図２４】

	5	4	3	2	1
精神負荷	ON	ON	OFF	OFF	OFF
	ON	OFF	OFF	OFF	OFF
	レーン逸脱作動	ACC作動	作動	OFF	OFF
	ON(1秒)	ON(0.8秒)	OFF	OFF	OFF
	0.9×Ka	0.9×Kb	Ka	Kb	Ka
	0.95×Ka	0.95×Kb	Ka	Kb	Ka
	1.05×Kb	1.05×Kb	Kb	Kb	Kb
身体負荷	OFF	OFF	OFF	OFF	OFF
	OFF	OFF	OFF	OFF	OFF
	OFF	OFF	OFF	OFF	OFF
	OFF	OFF	OFF	OFF	OFF
	1.5×Ka	1.5×Kb	1.1×Ka	Kb	Ka
	1.1×Ka	1.05×Kb	1.05×Ka	Ka	Ka
	1.1×Kb	1.1×Kb	1.05×Kb	Kb	Kb
通常時	OFF				
	OFF				
	OFF				
	OFF				
	Ka				
	Ka				
	Kb				

1段目	ACC動作状態
2段目	レーン逸脱装置動作状態
3段目	モニタへの表示内容
4段目	ブザーの動作状態
5段目	ステアリングギア比(Ka:通常時のギア比)
6段目	スロットルゲイン(Ka:通常時のゲイン)
7段目	ブレーキアシスト量(Kb:通常時のアシスト量)

フロントページの続き

(51)Int.Cl.'	識別記号	FI		テーマコード（参考）
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